

REMARKS

This Amendment is submitted in response to the Final Office Action dated October 28, 2010. Claims 1, 8-10, 12-14 and 16-22 are rejected under 35 U.S.C. §103. The Commissioner is hereby authorized to charge deposit account 02-1818 for any fees which are due and owing. If such a withdrawal is made, please indicate the Attorney Docket No. 3712174-00517 on the account statement. Applicants respectfully maintain disagreement with the rejections and provide additional support for this position, as set forth in detail below.

In the Office Action, Claims 1, 8-10, 12-14 and 17-19 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Publication No. 2001/0031509 A1 to Yamazaki et al. ("Yamazaki").

Independent Claims 1, 14 and 16 recite, in part, an organic EL device comprising an anode, a cathode, and an organic layer including a plurality of light emitting layers provided between the anode and the cathode, wherein said light emitting layers comprise a red light emitting layer provided on the anode, a green light emitting layer provided directly on the red light emitting layer, and a blue light emitting layer provided directly on the green light emitting layer. Similarly, independent Claim 8 recites, in part, a display comprising a color filter provided on a light take-out surface side of an organic EL device for emitting white light, wherein said organic EL device comprises an organic layer including a plurality of light emitting layers, said organic layer interposed between an anode and a cathode; and said light emitting layers comprise a red light emitting layer, a green light emitting layer, and a blue light emitting layer laminated in respective order from the anode side. Applicants respectfully maintain that Yamazaki fails to disclose or suggest each of the elements of the present claims, and provide additional arguments in support of this position below.

The main feature of the presently claimed invention is to provide a laminated structure of each color in consideration of the transportation property of the hole or the electron of each light emitting layer of an OLED. Applicants determined the OLED structure of the presently claimed invention by taking the transportation and recombination of charges into consideration, in addition to the laminating order of each layer.

In particular, according to the presently claimed invention, light emitting layers constituting the organic layer include a red light emitting layer, a green light emitting layer, and a blue light emitting layer laminated in this order from the anode side. (See, Specification US2006/0238113,

paragraph [0006]). In this configuration, unexpected results have been demonstrated regarding the lamination order of the color emitting layers (as opposed to alternative layering orders discussed in paragraph [0003] of the Background section of the present application). Particularly, the lamination of the red light emitting layer, the green light emitting layer, and the blue light emitting layer in this order from the anode side permits a configuration such that the injection of holes and electrons as well as the light emission regions can be controlled and that the emission efficacy is higher and the half life of luminance is longer, as compared with the case where a blue light emitting layer, the green light emitting layer, and a red light emitting layer are laminated in this order from the hole transport layer side. (See, Specification, paragraph [0007]).

Furthermore, in the organic EL device 1 according to the presently claimed invention in which the red light emitting layer 11 is present on the side of the hole transport layer 10, the green light emitting layer 12 is preferably provided between the red light emitting layer 11 and the blue light emitting layer 13. (See, Specification, paragraph [0052]). This is because of the problems that (1) in the case where the red light emitting layer 11 and the blue light emitting layer 13 are adjacent to each other, the energy of the excitons generated in the blue light emitting layer 13 would easily move into the red light emitting layer 11. (See, Specification, paragraph [0052]). As a result, a sufficient blue light intensity would not easily be obtained, and that (2) in the case where the blue light emitting layer 13 is provided between the red light emitting layer 11 and the green light emitting layer 12, the energy of the excitons would be deprived by both the red light emitting layer 11 and the green light emitting layer 12, and the like problems. (See, Specification, paragraph [0052]).

The blue light emitting layer 13 according to the present invention is so configured that the energy of excitons generated through re-coupling of positive and negative charges in the blue light emitting layer 13 is made to contribute to the light emission in the blue light emitting layer 13 while minimizing the movement of the energy into the red light emitting layer 11 and the green light emitting layer 12. (See, Specification, paragraph [0058]). Therefore, it is preferable for the blue light emitting layer 13 to be provided on the most cathode 5 side. (See, Specification, paragraph [0058]).

However, in contrast to the presently claimed invention, Yamazaki fails to disclose or suggest an organic layer including a plurality of light emitting layers provided between the anode and the cathode. Moreover, Yamazaki fails to disclose or suggest wherein said light

emitting layers comprise a red light emitting layer provided on the anode, a green light emitting layer provided directly on the red light emitting layer, and a blue light emitting layer provided directly on the green light, as recited in the present claims.

In contrast to the present claims, each of the OLED structures in Yamazaki have only one recombination region, thus only one light emitting region between the anode and the cathode. For example, with regard to Fig. 3B cited in the Office Action, Yamazaki discloses that: “the emission layer 309 is a three-layered structure composed of an emission layer 309a, an emission layer 309b, and an emission layer 309c.” (See, Yamazaki, [0035]). However, it is not the case that each of layers 309a, 309b, and 309c are separate light emitting layers. In this regard, “the cluster of organic substances 311 forms a hole trap region and the cluster of organic substances 312 forms an electron trap region” and “the hole injected from the anode 304 is trapped by the cluster of organic substances 311, and the electron injected from the cathode 306 is trapped by the cluster of organic substances 312.” (See, Yamazaki, [0036] and [0038]). As such, the combination of layers 309a, 309b, and 309c only have one recombination region. Accordingly, the-OLED structure in Yamazaki cannot emit light in each of the laminated light emitting layers.

The Office Action cites to paragraph [0040] of Yamazaki for disclosing the lamination of colors as RGB. (See, Office Action, pg. 3). However, this paragraph does not describe laminating different colored light emitting layers (e.g., a single layer being 309a, 309b, and 309c) on top of one another between an anode and a cathode, as presently claimed. Rather, this paragraph only describes that three different structures, such as shown in Fig. 3B, can be placed next to each other in line. Specifically, Yamazaki discloses that: “in the case of emitting color lights, three kinds of emission layers for the colors R (red), G (green), and B (blue) may be formed in line in each of the pixels.” (See, Yamazaki, [0040]). As such, it would seem that any color mixing would be accomplished in Yamazaki through lateral proximity of the three separate sub-pixels, rather than by vertically laminating three different light emitting layers between the same anode and cathode, as presently claimed.

It appears from paragraph (1) of the “Response to Arguments” section on pages 2-3 of the Office Action, that the Examiner maintains the position that Yamazaki is disclosing that layers 309a, 309b and 309c are disclosed and being red, green, and blue light emitting layers. Then, based on this position, the Examiner concludes that an ordering of layers as presently claimed would be obvious based on the fact that there are only six possible ordering

combinations of RGB. First, there is no support in Yamazaki for the position that layers 309a, 309b and 309c are disclosed as being red, green, and blue light emitting layers. On the contrary, Yamazaki discloses that all of these sublayers are of the same material. In particular, Yamazaki discloses: “Of course, the emission layer 309a, the emission layer 309b and the emission layer 309c are all made of the same organic EL film.” (See, Yamazaki, [0035]). Thus, the combination of sublayers 309a, 309b and 309c is an “emission layer 309” that emits only one color selected from RGB. As mentioned above, multiple emission layers 309 (each including three sublayers) that emit one of R, G or B may be placed in line next to one another. (See, Yamazaki, [0040]). Therefore, Yamazaki does not disclose any of the six combinations of RGB, RBG, GRB, GBR, BRG, and BGR cited on page two of the Office Action. Moreover, even assuming arguendo that Yamazaki did disclose a particular ordering of colored sublayers, and even given that there are only six permutations of the generic set {1,2,3}, there is no teaching or suggestion to adopt the particular ordering sequence recited in the presently claimed invention. Only the present Specification provides a motivation or suggestion to do so, as discussed above with regard to the particular unexpected results of the presently claimed invention.

With regard to paragraph (2) of the “Response to Arguments” section on page 3 of the Office Action, the three layers are not RGB, as discussed above with regard to paragraph (1). Thus, Applicants respectfully submit that any theories regarding separate recombination occurring in same are flawed.

With regard to paragraph (3) of the “Response to Arguments” section on page 3 of the Office Action, the three layers are not RGB, as discussed above with regard to paragraph (1). The Examiner interprets “in-line” as being vertically in-line based on the depiction of layers 309a, 309b and 309c shown in Fig. 3B of Yamazaki. However, as discussed above, because the emission layer 309a, the emission layer 309b and the emission layer 309c are all made of the same organic EL film, they do not emit separate RGB colors. Moreover, Applicants respectfully submit that one of ordinary skill in the art would understand that the term “in-line” in relation to a planar pixel area refers to laterally in-line, not vertically stacked.

Moreover, with regard to paragraph (4) of the “Response to Arguments” section on page 3 of the Office Action, it is noted that the Patent Office does not rely on Hatwar for disclosing a three layer light emitting structure.

Therefore, neither Yamazaki or Hatwar disclose or suggest a vertically stacked three layer light emitting structure as claimed, much less disclose or suggest the particular ordering of RGB from the anode side as required by the presently claimed invention. In addition, as mentioned above, the present disclosure demonstrated unexpected results (as discussed above) that the emission efficacy is higher and the half life of luminance is longer, as compared with the case where a blue light emitting layer, the green light emitting layer, and a red light emitting layer are laminated in this order from the hole transport layer side.

For at least the reasons above, Applicants respectfully submit that Yamazaki fails to disclose or suggest each of the elements of Claims 1, 8-10, 12-14 and 17-19.

Accordingly, Applicants respectfully request that the 35 U.S.C. §103(a) rejection of Claims 1, 8-10, 12-14 and 17-19 in view of Yamazaki be withdrawn.

The Office Action also rejected Claims 16 and 20-22 under 35 U.S.C. §103(a) as being unpatentable over Yamazaki in view of U.S. Pub. No. 2004/0185300 to Hatwar et al. ("Hatwar").

Regarding the Hatwar reference, only a laminating structure of two colors (Yellow/Blue) is disclosed. It is significantly easier to balance and obtain white color by laminating two colors, such as is disclosed in Hatwar. However, it is much more difficult to balance and obtain white color light by laminating three colors, as in the presently claimed invention. Especially, the light emitting layer in the middle layer of the three colors (in the embodiment, G) needs efforts, considering not only the order of colors but also the transportation and recombination of charges as in the present invention, to be emitted. Therefore, Hatwar fails to remedy the deficiencies of Yamazaki, even assuming that the references are properly combinable.

Accordingly, Applicants respectfully request that the 35 U.S.C. §103(a) rejection of Claims 16 and 20-22 over Yamazaki in view of Hatwar be withdrawn.

The Office Action also rejected dependent Claims 11 and 15 under 35 U.S.C. §103(a) as being unpatentable over Yamazaki in view of U.S. Patent No. 6,198,217 to Suzuki et al. ("Suzuki"). However, where Suzuki is merely relied on for the alleged disclosure regarding a protective film covering the organic layer, Suzuki fails to cure the deficiencies of Yamazaki discussed above, even assuming that the references are properly combinable.

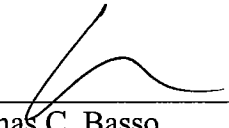
Accordingly, Applicants respectfully request that the 35 U.S.C. §103(a) rejection of Claims 11 and 15 over Yamazaki in view of Suzuki be withdrawn.

For the foregoing reasons, Applicants respectfully submit that the present application is in condition for allowance and earnestly solicit reconsideration of same.

Respectfully submitted,

K&L GATES LLP

BY



Thomas C. Basso
Reg. No. 46,541
Customer No. 29175

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